Organic micropollutants in sugar beets cultivated in sludge amended soil

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Organic micropollutants in sugar beets cultivated in sludge amended soil

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The world's phosphate resources are debated, and phosphorus conservation and recycling such as municipal sewage sludge is suggested as a plentiful source for nutrients, in particular primary macronutrients phosphorus (P) and nitrogen (N), as well as three secondary macronutrients: calcium (Ca), sulfur (S), magnesium (Mg). At the same time the sludge may contain organic micropollutants derived from industries and households that are unwanted in sludge intended for bio-fertilization of crops. Here the aim was to evaluate the risk exerted by organic micropollutants when sewage sludge was used as fertilizer. The chosen crop, sugar beet (Beta vulgaris) is cultivated for its high concentration of sucrose. It's grown commercially, and accounts for 20% of the world's sugar production (The Food and Agriculture Organization, 2009). The case site has been subjected to sludge amendments since 1981, and chemical analyses of 29 organic micropollutants were conducted in soil, sugar beet root and sugar beet leaves (Hörsing et al. 2014). In the sludge amended soil, none of the micropollutants was observed in quantifiable levels. In the sugar beet roots were the branched phenols (nonyl and octyl phenols) present where the soil had been fertilized with sewage sludge and with mineral fertilizer. Polycyclic aromatic hydrocarbons (PAHs) in sugar beet leaves uniformly distributed in sludge amended and unamended fields, thus, the source for them were most likely atmospheric deposition, Figure 1. Chemical fingerprinting of the PAHs confirmed that they originated from traffic. A person of 60 kg needs to consume 34 kg of sugar beet root per day in order to be at risk with respect to Tolerable daily intake (TDI). The distances between highways and agricultural fields are not to be disregarded as PAHs were present here although the distances were more than 600 meters. Vegetable screens such as acoustical barriers may be needed to safe guard leaf vegetables.

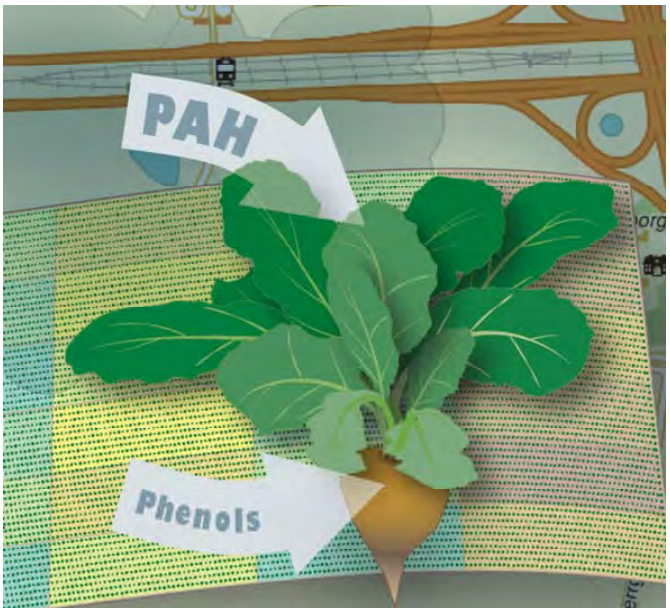

Figure 1. Micropollutant flux into sugar beets

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